MATERIALS HAULING EQUIPMENT LOADING

"Materials Hauling Equipment" (MHE) is a general name for vehicles such as dump trucks, trailers, earth movers, and transit-mix trucks. These vehicles have pneumatic tires and normally make repeated structure crossings. In order to be a subject of this Memo to Designers, they must also exceed the maximum weight limitations set forth in Division 15 of the *California Vehicle Code*. They must be overloaded. Truck cranes which fall within the limits of MHE loading may also cross structures. For cranes which are stopped on a structure to operate, refer to Memo to Designers 15-16 "Occasional Overloads on Structures While Under Contract Administration".

The District has the responsibility of determining structures to accommodate Materials Hauling Equipment loading. See Topic 110.1 of the *Highway Design Manual*. It is the Design Engineer's responsibility to contact the District in the early planning stage to discuss materials hauling including the fact that MHE must weigh beyond Vehicle Code limitations in order to be a consideration. If MHE loading is required, design and criteria will be as follows:

1. The Materials Hauling Equipment design loading consists of the load represented by the chart and loading diagram shown below:

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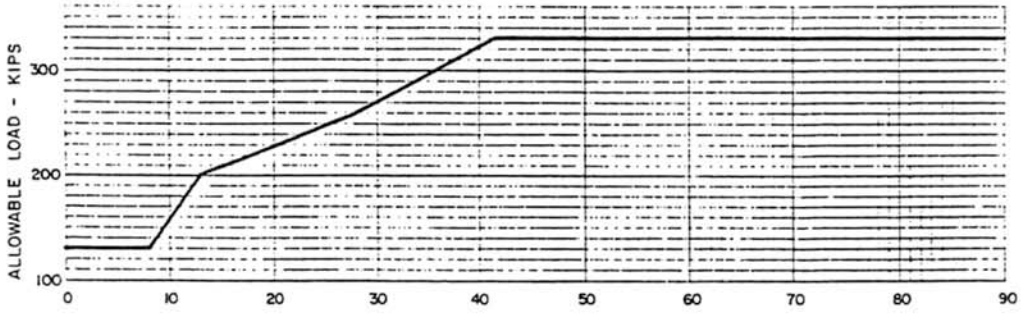
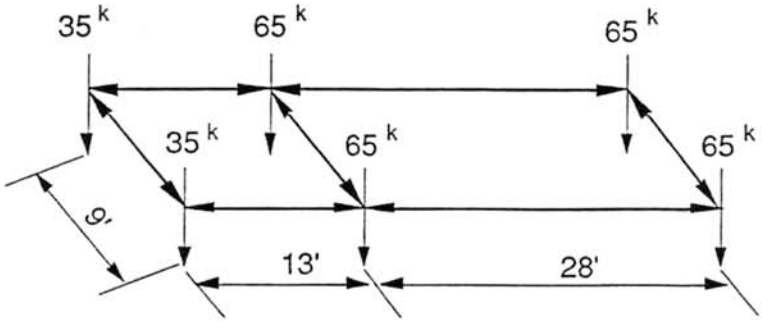
Axle pairs less than 8' apart will be considered as a single axle.
Maximum single axle load = 130k
The gross axle loads in pairs or in total, must be within the limits shown below.



Supersedes Memo to Designers 15-15 dated October 1972



Design Materials Hauling Equipment

2. Show this chart and loading diagram on the plans. Decals are available as are standard CADD Patterns.

3. Revise the live loading note on the General Plan thus:

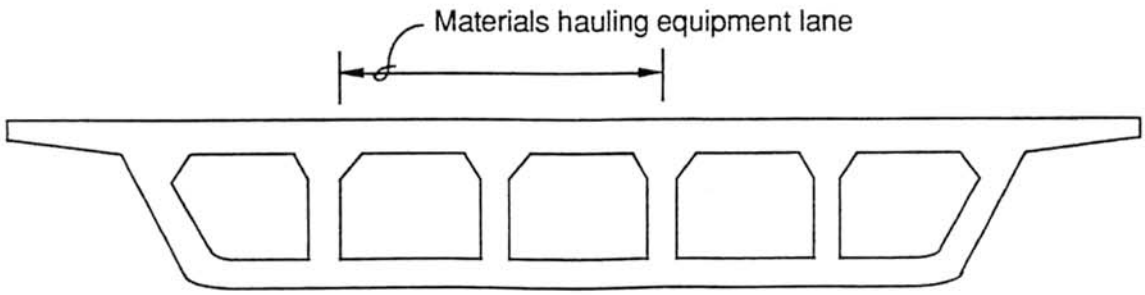
   Live Loading: HS20-44 and Alternative and Permit Design Load.
   For Materials Hauling Equipment loadings see chart on _____ sheet for other permissible axle spacings and loadings.

4. Use Load Factor Design methods including slab design. Use normal impact. Use a Beta Factor of 1.15 for Materials Hauling Equipment loading. This factor corresponds to the green operating level which is appropriate for the many trips made by MHE. When footnote *f* of table 3.23.1 Bridge Design Specification (widely spaced girders) applies, the Beta Factor becomes (1.15)(1.15) = 1.32. The purple level (Beta = 1) is reserved for loads with 10 or fewer repetitions.

5. Earth cover is normally not placed on deck.

6. Design for 200 feet minimum distance between Materials Hauling Equipment loads.

7. Delineate the MHE lane as illustrated below in the Typical Section of the General Plan and on the Typical Section Sheet. If possible locate the lane away from the exterior girders. An MHE lane is normally 20' wide.



8. For bridges (other than CIP concrete box girders) with roadway widths of 28 feet or less (between rails), design the entire section for materials hauling equipment loading.

   For roadway widths greater than 28 feet (between rails), strengthen only the 20-foot section or 20+ feet depending on the girder spacing.

9. For CIP concrete box girder bridges, it is permissible to average the strengthening for one materials hauling lane over approximately 50' of bridge width depending on girder spacing. Determine live load distribution by influence lines from LANELL. See Memo to Designers 15-20.

10. For prestressed concrete members determine the prestressing force from loads at the service level. Use normal stresses. Design for the ultimate moment capacity and shear by Load Factor Design using Beta factors as described in this Memo to Designers.

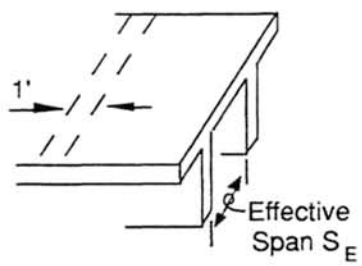
    When defining Pj for MHE lane girders, consider the variation in force allowed between girders by Memo to Designers 11-1.

11. Wheel line distribution factors for girder design are as follows for closely spaced girders:

    T Beams: S/9.5
    Steel and Precast Prestressed: S/10
    Box Girders: Use LANELL* or S/11 if beyond scope of LANELL
    Slab Spans: E = 5' + .14S (max. 9')

    S = average girder spacing in feet
    E =width of slab in feet over which a wheel load is distributed
    * = for all girder spacings

12. Live load moments in transversely reinforced deck slabs *for one foot of width* are as follows:



Effective Span	SSM
4' to 11'	Use 16' k
11' to 16'	$5\sqrt{(S_E)}$
Over 16'	$S_E+\sqrt{(S_E)}$

For transverse slabs continuous over three or more girders the maximum live load moment may be assumed to be 80% of the simple span moment. Impact is 30%. Design charts for slabs with transverse reinforcement are available for MHE lanes. Contact a member of the Concrete Design and Reinforcement Committee.

13. HS or P live load may govern part or all of design depending on configuration of structure.

14. Ordinarily, the substructure will not be affected, but it should be considered, especially single column bents.

The standard specifications allows contractors to request redesign of proposed structures to carry overloads. If the Office of Structure Construction requests redesign, the procedures will be as stated in this memo. The maximum vehicle size allowed will be the MHE design load.

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